

# Forest fire risk reduction techniques in the community forests of Nepal<sup>1</sup>

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## Abstract

Forest fires occur annually in all the major climatic regions of Nepal, including the Terai<sup>3</sup> and inner Terai. By destroying natural vegetation, forest fires are degrading Nepal's biological diversity. There are several causes of community forest fires: hunting and poaching of wild animals (23%); throwing cigarettes (19%); intentional fires to hasten the growth of grass fed to livestock (18%); collection of herb and honey (8%); children playing (8%); security from armed groups (6%); and collection of charcoal (5%). Unknown reasons comprised 4% of the causes of forest fires.

Community people are knowledgeable about the hazards and causes of forest fires. Therefore, their involvement is necessary for fire hazard reduction. Community-based organizations can provide solutions to the problem of forest fires. Community level fire control groups should be formed and trained on fire prevention and provided with fire fighting equipment. The top-down approaches adopted by government have failed to address the specific needs of vulnerable communities and ignored indigenous capacities and mechanisms. A fire forecasting system can help community forest users' group and other stakeholders to manage and conserve the fire prone areas more effectively and efficiently. Both community-based and scientific knowledge and technology should be embraced and applied. The results of this study will be disseminated through workshops at the national and district levels. The research outputs will also be published in English and Nepalese languages (in booklet and leaflet forms) and will be distributed to the stakeholders of the community forests.

## Introduction

Forest resources enable people, especially rural households in mid-hills and inner Terai, to earn their daily living in Nepal. One million hectares of forest have already been handed over to 14,000 community forest users' groups (CFUG) in Nepal (DoF, 2004). The District Forest Office (DFO) in Chitwan has formed 47 FUGs and has handed over forests at the community level until 2004 (DFO Chitwan, 2004).

Nepal does not have actual data about the number of fires, severity, and amount of loss. Nonetheless, forest fires occur annually in all major climatic regions of the country, including the Terai and inner Terai regions, during the dry season from February to May. Once the monsoon season starts in the middle of June, the forest fire problem disappears in the country.

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<sup>3</sup> The Terai region is composed of a 26 to 32 km wide broad belt of alluvial and fertile plain in the southern part of Nepal. This belt extends from the westernmost part of the country to the eastern limit and covers about 17% of the total land area

Forest fires degrade the soil, inducing floods and landslides. The risk of forest fires from state owned forests is high and destroys community forests (CFs). However, there is no systematic plan to reduce and prevent fire hazards. With difficult topographical conditions, hot and dry climate, low level of education, lack of property, dependency on forest resources, and lack of proper extension activities, CFs have difficulties coping with forest fires. Illegal logging, accidental burning, carelessness, intentional fires, and encroachment on forest land for cropping and infrastructure development have destroyed the forest cover. Cattle grazing, smokers, and accidental burning comprise 54% of the known causes of forest fires; while 32% are of unknown causes (Sharma, 1996).

The latest forest inventory has indicated that from 1978 to 1994, Nepal's forest cover decreased from 38% of the land area to 29%. Another 10.6% of the land area is under shrub cover and about 45% had been covered with forest until 1966. The annual deforestation rate is estimated at 1.7%, of which forest fire is a major cause (The Kathmandu Post, April 3 2001). Forest fires cause the movement of dry air with smoke and pollutant gases that affect the health of people. Sharma (1996) observed that about 90% of the Terai forests were burned in 1995. Earlier observations [Goldammer (1993) cited in Sharma (1996)] confirm this. The estimated burned area of forest is more than 400,000 hectares, with fires burning at least 100 villages annually. In 1998, 20 reported incidents of fires in 15,140 hectares of forest area resulted in huge losses to life, property, and endangered species of flora and fauna. The estimated cost was USD 127,500.

The specific objectives of the research are the following:

1. To document existing forest fire risk reduction techniques in CFs.
2. To find out the causes and effects of forest fire in CFs.
3. To outline the role of stakeholders to reduce the risk of forest fire in CFs.
4. To promote policies and appropriate mechanisms on forest fire risk reduction in the CFs.

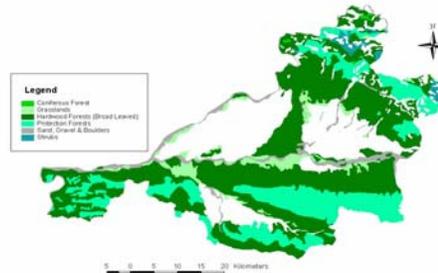
## Study Area

Chitwan district was selected as the study site because it is one of the fire-prone districts located in the central part of the country. The CFs were selected from the buffer zone and non-buffer zone forests where fires occur annually. The CFs from the buffer zones were: Chitrasen Buffer Zone CF, Daksin Kali Buffer Zone CF, and Milijuli Buffer Zone CF. The CFs from the non-buffer zones were: Panchakanya CF, Satanchuli CF, and Jaladevi CF. The following two maps show the Chitwan District and its forest patches:

**Map 1.** Map of Nepal showing Chitwan District



**Map 2.** Map of Chitwan showing Forest Patches



## Research Methods

Both primary and secondary data were collected. Secondary data was obtained from the Department of Forest (DoF), DFO-Chitwan, Chitwan National Park (CNP), National Trust for Nature Conservation (NTNC), Department of National Park and Wildlife Conservation, Forestry Research Division, NGOs working in the CF management, and concerned FUGs from buffer zones and non-buffer zones. Primary data was collected from the institutional survey of selected FUGs and members' household survey. The data gathered included causes of fire, effects of fire, fire types, duration of forest fires, and monthly distribution of forest fire incidents throughout the year. The following risk reduction mechanisms for forest fires were considered: extension programs, workshops, enforcement of laws and regulations, fuel management-fire line construction, control burning along the fire lines and construction forest tracks and roads, and clear demarcation of forests. Round table discussions were held with forestry professionals (DFO, NTNC, and CNP) and community people to compile their knowledge and experiences on forest fire risk reduction. Six focus group discussions (three each in buffer zone and non-buffer zone) were held to find the causes, effects, and indigenous techniques that CFs were using. During the dry season (February to May), the research team observed the damage caused by forest fires in the study area.

## Key Findings

**Causes of Forest Fires.** According to Sharma (1996), the fuels in the forest areas are highly combustible. Fuels found in the layers of Sal (*Shorea robusta*) leaves and other species comprise about 90%. Other surface fuels are from twigs and grasses. Some 10.7 tons of fuel can be found over dry areas.

There are two categories of the causes of forest fires: intended and unintended. In the former category, people deliberately start a fire in the forest to collect herbs, to hunt, and to hasten the growth of new grasses to feed livestock and use for roof cover in their village. The latter category consists of unextinguished cigarettes carelessly thrown away, burning of agricultural products, children playing, control burning that later becomes unmanageable, and careless travelers.

The following are the observed causes of forest fires in the selected six FUGs in the buffer zone and non-buffer zone.

**Table 1.** Causes of Forest Fires in the Buffer Zone CFs and Non-buffer Zone CFs

Causes of Forest Fire	Buffer Zone CFs			Non-buffer Zone CFs			Average (%)
	CBZCF	DKBZCF	MJBZCF	PCF	SCCF	JDCF	
To hasten growth of new grass	10	10	45	10	10	20	17.5
Cigarettes	20	20	10	20	20	20	18.33
Collection of herb/honey	5	-	5	10	25	5	8.33
Collection of charcoal	10	10	-	-	-	10	5
Hunting/poaching of wild animals (wild boar and others)	30	20	20	15	25	30	23.33
Playing children and cattle herders	5	20	-	10	10	-	7.5
Security reasons (from state and rebel groups)	-	10	-	15	-	10	6.0
To get rid of wild animals	10	10	15	10	10	5	10
Unknown reasons	10	-	5	10	-	-	4.0

**Acronyms:** CBZCF: Chitrasen Buffer Zone Community Forest, DKBZCF: Daksin Kali Buffer Zone Community Forest, MJBZCF: Milijuli Buffer Zone Community Forest, PCF: Panchakanya Community Forest, SCCF: Satanchuli Community Forest, JDCF: Jaladevi Community Forest

The observed causes of fires in CFs are largely anthropogenic. They are as follows: hunting and poaching of wild animals (23%); throwing of cigarettes (19%); intentional fires to hasten the growth of grass fed to livestock (18%); collection of herb and honey (8%); children playing (8%); security from armed groups (6%); and collection of charcoal (5%). Unknown reasons comprised 4% of the causes of forest fires.

The effects of seasonal forest fires can be very destructive, resulting in the loss of human lives, timber and non-timber forest products, livestock, and wild animals. With burned trees, stumps, flowers, grains, and seed, and damage to natural resources such as watersheds, the environment's recovery from forest fires may take several years. The destruction of animal and insect habitat causes imbalance in the ecosystem. The change in soil texture affects its capacity to hold water, kills microorganisms, and reduces organic matter in the soil. Smoke from forest fires causes haze in the villages, diminishing air quality.

In regions affected by forest fires, climate patterns become irregular because of the heat that rises to the atmosphere, contributing to global warming.

### **Community Based Forest Fire Management and Risk Reduction Techniques.**

Community people have developed their own methods and traditional ways of forest fire management. These include: worshipping the forest goddess; planting evergreen trees along the trails; collecting forest litter for animal bedding and making compost; patrolling within their CFs; penalty and reward system for the villages; construction of small ponds, forest tract and fire lines inside the forest; and early and controlled burning in the fire prone areas.

The problems that CFs are facing include the following: insufficient plans and programs to control fire with DFO and NTNC; inadequate human and financial resources; insufficient extension programs for community people, especially cattle herders, school children, and collectors of non-timber forest products (NTFPs); lack of strong policy or fire control rules and regulations; and lack of specific fire control organization as DFO; and NTNC not prioritizing the forest fire risk reduction program.

The top-down approaches adopted by government have failed to address the specific needs of vulnerable communities and ignored indigenous capacities and mechanisms. Community people are knowledgeable about the hazards and causes of forest fires. Therefore, their involvement is necessary for fire hazard reduction. Community-based organizations can provide solutions to the problem of forest fires. Sharing responsibilities, raising awareness, building capacity of FUGs, early warning and monitoring are the key aspects to strengthen fire risk reduction measures. In addition, community level fire control groups should be formed and trained on fire prevention and provided with fire fighting equipment.

Existing Forest Fire Regulations and Organizations. Clause B, Section 49 of the 1993 Forest Act, states that “starting a fire or doing anything that may cause a fire accident in natural forest is prohibited.” Clause 50 of the Act stipulates that “any person who commits such an offense shall be punished with a fine of not more than 10,000 Nepalese Rupees (approximately USD 140) or with imprisonment for a term not exceeding one year or both.” As the only legal provision for fire control, it is ineffective because it is extremely difficult to identify the offender. Every CF, however, has its own Operational Plan (OP) in forest fire management.

During the season of forest fires, Nepal Radio and Nepal Television broadcast clips on forest fire prevention and fire fighting. The Community Forestry Division of DoF also publishes and distributes leaflets, booklets, posters in the fire-prone areas to make people aware of the risks. The DFO used to hire temporary fire watchmen to help CFs in preventing and fighting fires. However, the lack of training, resources, appropriate skills, and specific organizations made this initiative ineffective.

Government support in the enactment of laws and policies for community based fire risk reduction and management is vital. DFO and NTNC have been ineffective because of the lack of resources; insufficient fire control and extension programs; inadequate fire control rules and regulations; absence of organizations responsible for preventing and fighting forest fires; and lack of proper risk reduction mechanisms. Preparedness consists of measures that enable governments, organizations, communities and individuals to respond rapidly and effectively to disaster situations (Carter, 1991). In the case of forest fires, it is important to formulate effective and updated counter disaster plans, provide a warning system, and implement public education, awareness, and training programs to FUG members.

## Recommendations

Since the people are the main cause of fires in community forests, prevention and control must involve communities. Fire management includes monitoring, early warning, prevention, preparation, suppression, and restoration activities that the community can take part. Investing in

fire education and training programs will substantially reduce the number of fires and the cost of fire management. The cost of fire education campaigns is very low compared to costs entailed in controlling fires and recovering from fire-inflicted damages. It is strongly recommended that a significant portion of the budget be allocated to forest fire prevention.

**National Level Stakeholders** are the DoF, Department of National Park and Wildlife Conservation, Community Forestry Division, NTNC, and Forest Research Division. Below are the recommendations for them:

- Include forest fire education in the school curriculum.
- Use satellite imagery (GIS technology) in government offices to monitor forest cover change and fire extent throughout the country and disseminate the information to CFs in fire-prone areas.
- Develop training curriculum for “community-based forest fires risk reduction program.” This program should impart skills for FUG members on forest fires risk reduction and effective use of indigenous knowledge.
- Conduct regular researches on forest fire to eliminate the repetition of previous mistakes, improve ongoing forest fire risk reduction capability, assist in reducing vulnerability to forest fire disasters, and stimulate forward-looking concepts for the future.
- Form specific institutions to deal with fire prevention extension activities, human resources development, law enforcement, fire suppression, and fire research.
- Prepare sufficient booklets, leaflets, and other educational materials (in local language with pictures) and distribute in the communities living in fire-prone forest areas.
- Formulate policies based on forest fire researches.

**District Level Stakeholders** are the DFO, CNP, District Development Committee (DDC), NTNC-District Office, and Federation of Community Forest Users' Group. Below are the recommendations for them:

- Provide appropriate training and distribute materials among FUG members, school children, cow herders, and school teachers.
- Identify a key partner institution to deliver training programs (including NGOs) and to enhance FUG members' response and preparedness capacity.
- Mobilize NGO resources to provide trainings to community leaders, teachers, and personnel on preventive measures of fires.
- Set up an early warning and communication system among community forests for possible outbreak of forest fires, and coordinate with other CFs.
- Enforce laws, regulations, and restrictions on community forests regarding fires.
- Authorities and communities should work as partners. Authorities should refrain from adopting top-down approaches with communities.
- Assist CFs to formulate effective and updated fire disaster plans.
- Prepare a detailed report about the occurrence, damage, and impact of fire and disseminate to all stakeholders.
- Conduct researches on local people's use of fire, yearly number of fires and burned areas, number of fires, fire distribution and direction, duration, monthly

distribution of fire incidents throughout the season, and impact on the different ecosystems.

**Community Level Stakeholders** are the CFUGs, Community People, Village Development Committee (VDC), Range Posts, and SAHARA—a local NGO. Below are the recommendations for them:

- Clear demarcation and fencing of forest areas to prevent children and travelers from entering.
- Raise awareness on the proper use of flammable materials among FUG members, school children, cow herders, and school teachers.
- Form teams of fire fighting volunteers in fire prone areas
- Construct fire lines, forest track, ponds, and canals according to the forest operational plan.
- Practice fuel management and control burning before fire season.
- Regularly organize fire prevention and suppression campaigns.
- Raise community people's awareness on safe forest fire risk reduction techniques.
- Train FUG members and other community people on the techniques to extinguish fires.
- Promptly detect fires through observation points, patrolling, communication network, fire forecasting (early warning system), and coordinating with nearby CFs.
- During fire incidents, clean fire lines and forest tracks if there are forest areas nearby so that fire would not spread from villages to the forest areas and vice versa.
- Conduct research to find the causes of fire and plan for future.

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